



# *X-Plain™*

## *Multiple Sclerosis*

### Reference Summary

Multiple sclerosis, or MS, is a disease of the brain and spinal cord. It affects about 400,000 Americans at any one time. Most patients with multiple sclerosis are able to lead a very functional life. However, MS causes a handicap for some patients.

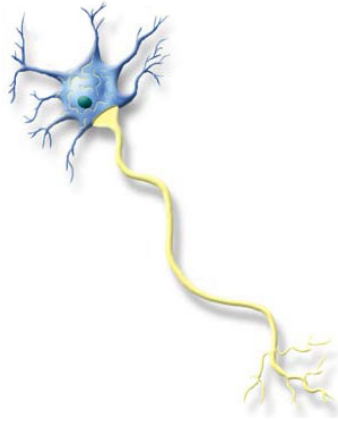
This reference summary will help you understand what multiple sclerosis is and how it can be treated. This program also discusses symptoms and causes of MS.

#### **Anatomy**

The brain is the command center of the body. In addition to thinking and feeling, it receives information and sends orders to different parts of the body. Orders from the brain travel through the spinal cord. From the spinal cord, orders travel to the rest of the body through peripheral nerves. Together, the brain and spinal cord are called the "central nervous system." The nerves in the rest of the body are called the "peripheral nervous system."

Different areas of the brain control different functions.

For example, specific areas of the brain control vision, motions, touch, hearing, and thinking. Like other tissue in the body, the brain is made of cells. The cells of the brain and nerves are called *neurons*. Each neuron has a body and an axon.



Axons are long fibers that are similar to electrical wires. Though neurons are microscopic, the axons can extend from the brain to the hand! Neurons communicate with each other by sending electrical signals through the axons. For instance, a nerve in the finger may sense heat, and send the message to the brain through axons. The brain would then send orders to the muscles to move the finger. Voluntary muscles are

directly controlled by nerves, which receive orders from the brain.

A special material called myelin covers axons. Myelin improves the conduction of the electric current and communication between neurons. In multiple sclerosis, the myelin in certain parts of the brain, spinal cord, or central nervous system is destroyed. Scientists currently do not know why this myelin is destroyed.

#### **Multiple Sclerosis**

In multiple sclerosis, the myelin that covers nerve cells becomes inflamed, swollen, and detached. It is then destroyed, forming a scar over the axons. *Sclerosis* means scar. When myelin is destroyed, the neurons communicate less effectively, causing the symptoms of multiple sclerosis. For instance, if the myelin of vision neurons is destroyed, vision is affected. If the myelin of muscle neurons is destroyed, the muscle becomes weak.

Some myelin destruction repairs itself, which is why

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most people improve after an attack of MS. However, myelin can become inflamed again at different times and in different places.

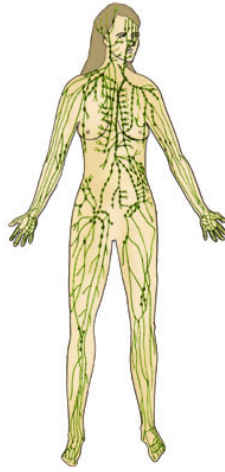
Multiple sclerosis may be mild or severe. In its simplest form, the symptoms are mild and do not get worse or lead to disability. This is called *benign MS* and occurs in about 15% of cases. In its most severe form, MS does not include periods of recovery or remission, symptoms do get worse, and new ones develop. This is called *progressive MS*.

Multiple sclerosis usually appears in people between the ages of 20 and 40. Women are affected twice as often as men. People who live in temperate climates are more likely to develop MS than those living in tropical areas. Mild climates include the northern United States, Canada, and Europe.

### Causes

Scientists do not know what causes the destruction of myelin in multiple sclerosis.

Some scientists believe that cells of the immune system attack the myelin in the central nervous system. The immune system usually attacks germs and foreign bodies.



Cells of the immune system may be attacking myelin in MS because they mistake it for a foreign, harmful material. This type of disease is called an autoimmune disease. Some researchers think that after certain types of viral infections, the immune system starts attacking the myelin of the central nervous system as if it were the virus.

There may also be genetic causes of MS because certain populations are more or less susceptible to it. For example, Eskimos never get MS and Native Americans have a very low incidence of it. This leads to the idea that MS may be partially hereditary.

### Signs & Symptoms

Symptoms of MS depend on the area of the central nervous system that loses myelin.

Early symptoms may include

- numbness or tingling in parts of the body, usually the leg or arm
- unexplained weakness, dizziness, and fatigue
- double vision, blurry vision, or blindness

During periods of remission, the patient may feel better, but the arm or leg may feel stiff. Some weakness, numbness, and vision problems may remain.

As the symptoms come back, they may become more severe and include

- muscle spasms
- bowel and bladder problems
- slurred speech
- blindness
- sexual problems
- paralysis
- confusion and forgetfulness

In some patients, heat seems to make symptoms worse. Such patients should avoid long hot baths or being outside too long on hot days.

Most people with MS do NOT develop the most severe symptoms. They regain enough function to allow them to continue leading a normal life. Only a small number of MS patients become debilitated by the disease.

## Diagnosis

Physical examination and medical history are very important in diagnosing MS. Physical exams include a variety of tests to check the health of the nerves and muscles. A diagnosis of MS relies primarily on seeing patches of destroyed myelin on a magnetic resonance imaging (MRI) scan. As the doctor tracks the progress of the disease, multiple MRIs may need to be done.

If a diagnosis is still questionable, spinal fluid may be taken from the back to test for abnormalities. Other tests aim at measuring the speed of the brain connections. For example, the Visual Evoked Response test measures the speed of the visual pathway. The Brain Stem Evoked Response test measures the speed of the auditory, or hearing, pathways.

## Treatment

Scientists have not discovered a cure for MS yet. However, several medications are available to help control the disease. If symptoms are not severe and attacks are not frequent, the doctor may prefer to just observe the progress of MS.

If symptoms continue to come back, medication may be prescribed to control the progress of MS. Such medi-

cations may reduce the severity of the symptoms or decrease how often they occur. Steroids are sometimes used to shorten and reduce the severity of the symptoms. A daily injection of a special chemical may be used to decrease the frequency of symptom relapses. The special chemical, from the interferon family, helps calm the defense cells, which in turn decreases number of attacks.



Other medications aim at improving neurological problems. For example, medication can be used to decrease the stiffness of the muscles.

Physical and occupational therapy can help improve weakness left after an episode. Depression may accompany MS. If this happens, it can be treated with anti-depressant and stress-relieving therapies.

Adopting healthy life habits helps MS patients cope with fatigue and potential stress

caused by MS. These habits include

- getting enough rest
- exercising regularly
- eating a healthy, balanced diet with lots of fiber
- relaxation and reducing stress in your life

## Summary

Multiple sclerosis is a disease of the brain and spinal cord. It can be debilitating, however, most people with MS are able to lead normal, active lives and pursue their hobbies. If you have symptoms of MS, such as numbness or tingling in any part of your body, check with your doctor. Other symptoms of MS include double vision, blindness, muscle tremor, fatigue, and dizziness. MS can be treated with medication. Some cases of MS are benign and only need to be observed without any treatment. Keeping healthy life habits and staying connected with friends and family are great ways to cope with multiple sclerosis and limit the fatigue and stress it may place on the body.